[0074] If there is no communication link **18** (and therefore no prediction server **30**), the prediction functionality is completely realized in local controller **20**. Hardware requirements for implementation of local controller **20** are very high in this case since computationally heavy prediction algorithms must run on the local controller hardware.

[0075] Following TABLES 1 to 4 illustrate task sharing between local controller **20** and prediction server **30** for various cases based on existence/inexistence of each of renewable generation **16** and unreliable grid supply **17** in the energy supply system.

TABLE 1

In case of energy supply system consisting of energy storage, load and generator

Type of communication link	Prediction server	Local controller
High quality communication link	Load prediction, + optimization	Real time control
Low quality communication link	Load prediction, + data compression	Local load prediction, optimization, and real time control
No communication link	none	Local load prediction, optimization, and real time control

TABLE 2

In case of energy supply system consisting of energy storage, load, generator and renewable generation

Type of Communication link	Prediction server	Local controller
High quality communication link	Load prediction, and renewable power prediction, + optimization	Real time control
Low quality communication link	Load prediction, and renewable power prediction, + data compression	Local load prediction, local renewable power prediction, optimization, and real time control
No communication link	none	Local load prediction, local renewable power prediction, optimization, and real time control

TABLE 3

In case of energy supply system consisting of energy storage, load, generator and unreliable grid supply

Type of communication link	Prediction server	Local controller
High quality communication link	Load prediction, and blackout duration probability function prediction, + optimization	Real time control
Low quality communication link	Load prediction, and blackout duration probability function prediction, + data compression	Local load prediction, local blackout duration probability function prediction, optimization, and real time control
No communication link	none	Local load prediction, local blackout duration probability function prediction, optimization, and real time control

TABLE 4

In case of energy supply system consisting of energy storage, load, generator, renewable generation and unreliable grid supply

Type of Communication link	Prediction server	Local controller
High quality communication link	Load prediction, renewable power prediction, and blackout duration probability function prediction, + optimization	Real time control
Low quality communication link	Load prediction, renewable power prediction, and blackout duration probability function prediction, + data compression	Local load prediction, local renewable power prediction, local blackout duration probability function prediction, optimization, and real time control
No communication link	none	Local load prediction, local renewable power prediction, local blackout duration probability function prediction, optimization, and real time control

[0076] Again, the use of local blackout duration probability function prediction module **24** characterizes the exemplary embodiment together with local optimization module **25**. As mentioned before, depending on the quality and availability of communication link **18** and the used hardware, the optimization can be carried out in local optimization module **25** in local controller **20** or communication module **32** in prediction server **30**. However, the functionality of them is the same. In the exemplary embodiment, the output of the optimization are two time variant parameters as shown in FIG. **7**: lower discharge limit $p_{low}(t)$ and upper charge limit $p_{high}(t)$. Both are inputs for real time control module **25**.

[0077] In FIG. **7**, temporal change of SOC (state of charge) of energy storage **11** such as a Li-ion battery during blackout of the grid is illustrated. Allowable minimum SOC and allowable maximum SOC of energy storage **11** are indicated by SOC_{min} and SOC_{max}, respectively. According to the optimization of the exemplary embodiment, both limits $p_{low}(t)$ and $p_{high}(t)$ vary in a range between SOC_{min} and SOC_{max}, and the variation range of the SOC of energy storage **11** is controlled within a region defined by time variable limits $p_{low}(t)$ and $p_{high}(t)$. For example, during the blackout of the grid, energy storage **11** is first set to a discharge mode (shown by "A" in the figure) and then, when the SOC reaches $p_{low}(t)$, energy storage **11** is set to a charge mode (shown by "B" in the figure) by starting generator **13**. When the SOC reaches $p_{high}(t)$, generator **13** is stopped and energy storage **11** is set to the discharge mode again. The charging and discharging are repeated to constitute charge/discharge cycles.

[0078] Next, the optimization method will be explained in detail.

[0079] By using the prediction parameters and a model of the energy supply system, these parameters can be find by using optimization technology (e.g., simulation based genetic algorithm based optimization) in order to guarantee optimal operation. Simulation based optimization allows for considering battery charging and discharging efficiency and AC/DC or DC/AC conversion losses in the optimization.